Grades 6-12

Arkansas
Disciplinary Literacy Standards
Resource for Science

2016

Introduction

The Arkansas Disciplinary Literacy Standards for Grades 6-12 describe the requisite knowledge and skills for reading and writing in history/social studies, science, and technical subjects. Although the standards are divided into reading and writing strands for conceptual clarity, the processes of communication are closely connected and should be integrated during instruction. The reading standards are further divided into Reading in History/Social Studies and Reading in Science and Technical Subjects.

The goal of these standards is to prepare students for success as they enter the workforce or higher education institutions. To be ready for college, workforce training, and life in a technological society, students need the ability to gather, comprehend, evaluate, synthesize, and report on information and ideas, to conduct original research in order to answer questions or solve problems, and to analyze and create a high volume and extensive range of print and non-print texts in media forms old and new.

The Arkansas Disciplinary Literacy Standards for Grades 6-12 are built from the same anchor standards as the Arkansas English Language Arts Standards, which supports alignment of the standards across the disciplines. Disciplinary literacy should not be confused with the content area of English Language Arts, which focuses on learning the English language, reading literature and literary nonfiction, and writing about related topics. Therefore, the Arkansas Disciplinary Literacy Standards allow flexibility for each discipline to define the types of texts and forms of writing that are unique and appropriate for each domain. For example, argumentative writing might take on the form of writing an explanation for an investigation in science, or writing an account of history that synthesizes and corroborates information from a variety of primary and secondary sources. The same type of differentiation is also true for reading. Texts in science might include articles from scientific journals, lab reports, white papers on scientific topics, diagrams, and data displays. Texts in history might include diaries, newspaper articles, maps, eyewitness accounts, and photographs.

The goal of science is the construction of theories that can provide explanatory accounts of features of the world. A theory becomes accepted when it has been shown to be superior to other explanations in the breadth of phenomena it accounts for and in its explanatory coherence and parsimony. Scientific explanations are explicit applications of theory to a specific situation or phenomenon, perhaps with the intermediary of a theory-based model for the system under study. The goal for students is to construct logically coherent explanations of phenomena that incorporate their current understanding of science, or a model that represents it, and are consistent with the available evidence (A Framework for K-12 Science Education, NRC, 2012).

In science, reasoning and argument are essential for identifying the strengths and weaknesses of a line of reasoning and for finding the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their own understanding in light of the evidence and comments offered by others, and collaborate with peers in searching for the best explanation for the phenomenon being investigated (A Framework for K-12 Science Education, NRC, 2012). Argumentation involves a

level of uncertainty—one argues to clarify for herself or to persuade others who have a different idea. A measure of uncertainty is powerful for constructing open-ended, authentic investigations for a class. Focusing on explanation and ignoring argumentation may inhibit such investigations. If this intellectual work is only framed for students as explanation then the classroom process of exploring and testing different student ideas through evidence-based argument may not happen. Explanation can easily only focus on finding the "right answer"—rather than developing an understanding of the conceptual ideas. (http://stemteachingtools.org/brief/1).

How to Label the Anchor Standards

The letter in the first position of the anchor standard numbering system represents the strand:

Reading (R)

Writing (W)

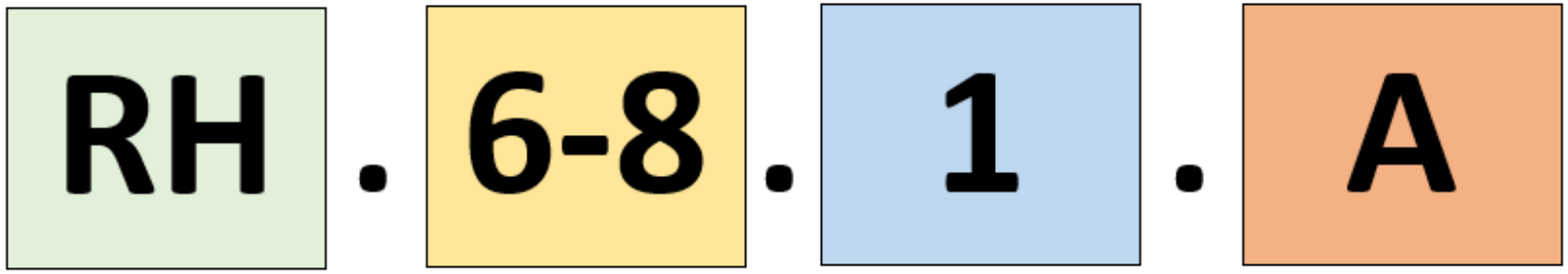
Speaking and Listening (SL)

Language (L)

The symbol in the second position of the anchor standard numbering system represents college and career readiness.

The number in the third position of the anchor standard numbering system represents the standard.

How the Disciplinary Literacy Standards are Labeled



The letter in the first position represents the strand.

Reading: History/Social Studies Texts (RH)

Reading: Science and Technical Texts (RST)

Writing: History/Social Studies, Science, or Technical Texts (WHST)

The numbers in the second position represent the grade band.

The number in the third position represents the standard.

Some standards are broken into segments that are represented by a letter in the fourth position.

Arkansas Anchor Standards for Reading 6-12

The Arkansas Disciplinary Literacy Standards for college and career readiness on the following pages define what students should understand and be able to do by the end of the grade span. They correspond by number to the Arkansas Anchor Standards for college and career readiness. The Arkansas Anchor Standards for college and career readiness and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
3. Analyze how and why individuals, events, and ideas develop and interact over the course of a text.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meaning; analyze how specific word choices shape meaning and/or tone.
5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, stanza) relate to each other and the whole.
6. Assess how point of view, perspective, and/or purpose shapes the content and style of a text.

Integration of Knowledge and Ideas

7. Integrate and evaluate content presented in diverse media and formats.
8. Analyze and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence
9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches of the author(s).

Range of Reading and Level of Text Complexity

10. Read and comprehend complex literary and informational texts independently and proficiently.

Note on range and content of student reading
Reading is critical to building knowledge in history/social studies as well as in science and technical subjects. College and career ready reading in these fields requires an appreciation of the norms and conventions of each discipline, such as the kinds of evidence used in history and science; an understanding of domain-specific words and phrases; an attention to precise details; and the capacity to evaluate intricate arguments, synthesize complex information, and follow detailed descriptions of events and concepts. In history/social studies, for example, students need to be able to analyze, evaluate, and differentiate primary and secondary sources. When reading scientific and technical texts, students need to be able to gain knowledge from challenging texts that often make extensive use of elaborate diagrams and data to convey information and illustrate concepts. Students must be able to read complex informational texts in these fields with independence and confidence because the vast majority of reading in college and workforce training programs will be sophisticated nonfiction. It is important to note that these Reading standards are meant to complement the specific content demands of the disciplines, not replace them.

Reading Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Key Ideas and Details		
RST.6-8.1 **Cite specific textual evidence to support analysis of science and technical texts.**	**RST.9-10.1** **Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.**	**RST.11-12.1** **Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.**
RST.6-8.2 **Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.**	**RST.9-10.2** **Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.**	**RST.11-12.2** **Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.**
RST.6-8.3 **Follow precisely a multistep procedure when carrying out experiments taking measurements, or performing technical tasks.**	**RST.9-10.3** **Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.**	**RST.11-12.3** **Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.**
Teacher Notes		

These standards focus on text-based analysis that uses evidence from the text for supporting students' conceptual understanding of science phenomena. Being able to read, interpret, and produce scientific and technical text is a fundamental practice of science and engineering, as is the ability to communicate clearly and persuasively (NGSS for states, by states, 2013).		
RST.6-8.1,2,3 Examples of science texts could include OER (Online Education Resources), science journal articles, scientific models, student-generated data and charts, science notebook entries, historical science experiments, maps, timescales, real-time data, news articles, videos/visualizations, APPs, procedural texts, statistical information, scientific tools, Punnett squares, Safety Data Sheets (SDS), and mathematical models (e.g. equations, algorithms). OER's could be found at the following science associations (e.g. NOAA, NASA, NSTA, NatGEO). Examples of science technical texts could include engineering design models, manuals, mechanical lists, technical specifications, decision matrices, rubrics, and dichotomous keys.	**RST.9-10.1,2,3** Examples of science texts could include OER (Online Education Resources), science journal articles, scientific models, student-generated data and charts, science notebook entries, historical science experiments, maps, timescales, real-time data, news articles, videos/visualizations, APPs, procedural texts, statistical information, scientific tools, Punnett squares, Safety Data Sheets (SDS), and mathematical models (e.g. equations, algorithms). OER's could be found at the following science associations (e.g. NOAA, NASA, NSTA, NatGEO). Examples of science technical texts could include engineering design models, manuals, mechanical lists, technical specifications, decision matrices, rubrics, and dichotomous keys. Examples of scientific models that can be used as textual evidence could include karyotypes, pedigrees, 2-D and 3-D models, population changes gathered from simulations or historical data sets.	**RST.11-12.1,2,3** Examples of science texts could include OER (Online Education Resources), science journal articles, scientific models, student-generated data and charts, science notebook entries, historical science experiments, maps, timescales, real-time data, news articles, videos/visualizations, APPs, procedural texts, statistical information, scientific tools, Punnett squares, Safety Data Sheets (SDS), and mathematical models (e.g. equations, algorithms). OER's could be found at the following science associations (e.g. NOAA, NASA, NSTA, NatGEO). Examples of science technical texts could include engineering design models, manuals, mechanical lists, technical specifications, decision matrices, rubrics, and dichotomous keys. Examples of scientific models that can be used as textual evidence could include karyotypes, pedigrees, 2-D and 3-D models, population changes gathered from simulations or historical data sets.

	RST.9-10.3 The scientific and engineering practices support the iterative process of science investigation and are not limited to a linear multistep procedure such as the traditional scientific method or cookbook lab.	**RST.11-12.1** In science texts, gaps or inconsistencies could include bias accounts, misconceptions, lack of evidence, and misrepresentation of information. **RST.11-12.3** The scientific and engineering practices support the iterative process of science investigation and are not limited to a linear multistep procedure such as the traditional scientific method or cookbook lab.

Reading Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Craft and Structure		
RST.6-8.4 **Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to Grades 6-8 texts and topics.**	**RST.9-10.4** **Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.**	**RST.11-12.4** **Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.**
Teacher Notes		
Students transfer common language into scientific language through hands-on experiences, investigations, observations of science phenomena, reading scientific texts, and classroom discussions. (e.g., there is a difference between a scientific theory and the word "theory" used in general conversation). Examples of authors in science could include students, scientists, science associations, and teachers.		
RST.6-8.4 Examples of domain-specific words and phrases could include Greek and Latin roots (e.g. lymph-, -ology, endo-, exo-, bio-) scientific nomenclature (e.g. *Genus species*, chemical molecular compounds), symbols (H_2O, North Star, infinity), scientific notation (e.g. exponents, 10^2 N=), and mathematical/scientific formulas (e.g. *Density=mass/volume, Force=Mass*	**RST.9-10.4** Examples of domain-specific words and phrases could include Greek and Latin roots (e.g. lymph-, -ology, endo-, exo-, bio-) scientific nomenclature (e.g. *Genus species*, chemical molecular compounds), symbols (H_2O, North Star, infinity), scientific notation (e.g. exponents, 10^2 N=), and mathematical/scientific formulas (e.g. *Density=mass/volume, wave speed*	**RST.11-12.4** Examples of domain-specific words and phrases could include Greek and Latin roots (e.g. lymph-, -ology, endo-, exo-, bio-) scientific nomenclature (e.g. *Genus species*, chemical molecular compounds), symbols (H_2O, North Star, infinity), scientific notation (e.g. exponents, 10^2 N=), and mathematical/scientific formulas (e.g. *Density=mass/volume, wave speed*

x Acceleration).	= *frequency x lambda)*, and chemical equations.	= *frequency x lambda)*, and chemical equations.

Reading Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Craft and Structure		
RST.6-8.5 **Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.**	**RST.9-10.5** **Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).**	**RST.11-12.5** **Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.**
Teacher Notes		
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs.		
RST.6-8.5 Examples of science text features could include map legends, text titles, in-text references, footnotes, bibliographies, citations, scientific nomenclature, and acronyms. Examples of text structures could include claims, evidence, and reasoning components.	**RST.9-10.5** Examples of science text features could include map legends, text titles, in-text references, footnotes, bibliographies, citations, scientific nomenclature, and acronyms. Examples of text structures could include claims, evidence, and reasoning components.	**RST.11-12.5** Examples of science text features could include map legends, text titles, in-text references, footnotes, bibliographies, citations, scientific nomenclature, and acronyms. Examples of text structures could include claims, evidence, and reasoning components.

Reading Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Craft and Structure		
RST.6-8.6 **Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.**	**RST.9-10.6** **Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address.**	**RST.11-12.6** **Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved.**
Teacher Notes		
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and progresses to evaluating the validity and reliability of the claims, methods, and designs (NGSS for states, by states, 2013).		
RST.6-8.6 Examples of author's purpose are to scientifically explain, persuade, make a claim, and analyze text. Science texts are uniquely structured to indicate cause and effect, problem and solution, compare and contrast and sequential order.	**RST.9-10.6** Examples of author's purpose are to scientifically explain, persuade, make a claim, and analyze text. Science texts are uniquely structured to indicate cause and effect, problem and solution, compare and contrast and sequential order.	**RST.11-12.6** Examples of author's purpose are to scientifically explain, persuade, make a claim, and analyze text. Science texts are uniquely structured to indicate cause and effect, problem and solution, compare and contrast and sequential order.

Reading Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Integration of Knowledge and Ideas		
RST.6-8.7 **Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).**	**RST.9-10.7** **Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.**	**RST.11-12.7** **Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.**
RST.6-8.8 **Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.**	**RST.9-10.8** **Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem.**	**RST.11-12.8** **Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.**
RST.6-8.9 **Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.**	**RST.9-10.9** **Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.**	**RST.11-12.9** **Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.**

Reading Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Range of Reading and Level of Text Complexity		
RST.6-8.10 **By the end of Grade 8, read and comprehend science/technical texts in the Grades 6-8 text complexity band independently and proficiently.**	**RST.9-10.10** **By the end of grade 10, read and comprehend science/technical texts in the grades 9–10 text complexity band independently and proficiently.**	**RST.11-12.10** **By the end of grade 12, read and comprehend science/technical texts in the grades 11–CCR text complexity band independently and proficiently.**
Teacher Notes		
Reading a science text requires a set of discipline-specific skills and strategies. Science texts use scientific vocabulary and present information in several different formats (charts, graphs, timelines, photographs, videos, maps, flowcharts, diagrams, models, and tables). Students in science classrooms could read at different levels of proficiency so teachers should have an understanding of how complex a text is and implement appropriate strategies to support student conceptual understanding of science phenomena.		
RST.6-8.10 Information about text complexity can be found in the CCSS Appendix A pg. 4-9.	**RST.9-10.10** Information about text complexity can be found in the CCSS Appendix A pg. 4-9.	**RST.11-12.10** Information about text complexity can be found in the CCSS Appendix A pg. 4-9.

Arkansas Anchor Standards for Writing

The Grades 6-12 standards for disciplinary literacy on the following pages define what students should understand and be able to do by the end of the grade span. They correspond by number to the Arkansas Anchor Standards for college and career readiness. The Arkansas Anchor Standards for college and career readiness and grade-specific standards are necessary complements—the former providing broad standards, the latter providing additional specificity—that together define the skills and understandings that all students must demonstrate.

Text Types and Purposes

1. Write arguments to support claims when analyzing substantive topics or texts using valid reasoning and relevant, sufficient evidence.
2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details and well-structured event sequences.

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
5. Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.
6. Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
9. Draw evidence from literary and/or informational texts to support analysis, reflection, research, and synthesis.

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

Note on range and content of student writing
For students, writing is a key means of asserting and defending claims, showing what they know about a subject, and conveying what they have experienced, imagined, thought, and felt. To be college- and career- ready writers, students must take task, purpose, and audience into careful consideration, choosing words, information, structures, and formats deliberately. They need to know how to combine elements of different kinds of writing--for example, to use narrative strategies within argument and explanation within narrative--to produce complex and nuanced writing. They need to be able to use technology strategically when creating, refining, and collaborating on writing. They have to become adept at gathering information, evaluating sources, and citing material accurately, reporting findings from their research and analysis of sources in a clear and cogent manner. They must have the flexibility, concentration, and fluency to produce high-quality first-draft text under a tight deadline as well as the capacity to revisit and make improvements to a piece of writing over multiple drafts when circumstances encourage or require it.

Writing Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Text Types and Purposes		
WHST.6-8.1 **Write arguments focused on discipline-specific content.** **WHST.6-8.1.A** **Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.** **WHST.6-8.1.B** **Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.** **WHST.6-8.1.C** **Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s),**	**WHST.9-10.1** **Write arguments focused on discipline-specific content** **WHST.9-10.1.A** **Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.** **WHST.9-10.1.B** **Develop claim(s) and counterclaims fairly, supplying data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form and in a manner that anticipates the audience's knowledge level and concerns.** **WHST.9-10.1.C** **Use words, phrases, and clauses to link the major sections of the text, create cohesion, and clarify the**	**WHST.11-12.1** **Write arguments focused on discipline-specific content** **WHST.11-12.1.A** **Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.** **WHST.11-12.1.B Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline-appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.** **WHST.11-12.1.C Use words, phrases, and clauses as well as varied syntax to**

counterclaims, reasons, and evidence. **WHST.6-8.1.D** **Establish and maintain a formal style.** **WHST.6-8.1.E** **Provide a concluding statement or section that follows from and supports the argument presented.**	**relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.** **WHST.9-10.1.D** **Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.** **WHST.9-10.1.E** **Provide a concluding statement or section that follows from or supports the argument presented.**	**link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.** **WHST.11-12.1.D Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.** **WHST.11-12.1.E Provide a concluding statement or section that follows from or supports the argument presented.**

Teacher Notes

Across science and technical subjects, students create different forms of writing than they do for other content areas. Argumentation is the process by which explanations and solutions are reached. Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). Engaging in argument from evidence in 9–12 builds on K–8 experiences and progresses to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science (NGSS for states, by states, 2013).

Science and technical texts often include charts, graphs, timelines, photographs, videos, maps, flowcharts, diagrams, models, and tables. It is critical that students know how to incorporate graphic representations that are appropriate for the discipline to support the scientific explanations and arguments being written.

WHST.6-8.1 Elements of argumentative writing in science includes making a claim and supporting that claim with evidence. Examples could include student-generated formal lab reports, journal abstracts, ethical theses, and evaluations of competing design solutions (engineering).	**WHST.9-10.1** Elements of argumentative writing in science includes making a claim and supporting that claim with evidence. Examples could include student-generated formal lab reports, journal abstracts, ethical theses, and evaluations of competing design solutions (engineering).	**WHST.11-12.1** Elements of argumentative writing in science includes making a claim and supporting that claim with evidence. Examples could include student-generated formal lab reports, journal abstracts, ethical theses, and evaluations of competing design solutions (engineering).

Writing Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Text Types and Purposes		
WHST.6-8.2 **Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**	**WHST.9-10.2** **Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**	**WHST.11-12.2** **Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.**
WHST.6-8.2.A **Introduce a topic clearly, previewing what is to follow; organize ideas, concepts, and information into broader categories as appropriate to achieving purpose; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.**	**WHST.9-10.2.A** **Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.**	**WHST.11-12.2.A** **Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.**
WHST.6-8.2.B **Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.**	**WHST.9-10.2.B** **Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.**	**WHST.11-12.2.B** **Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.**

WHST.6-8.2.C **Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.**	**WHST.9-10.2.C** **Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.**	**WHST.11-12.2.C** **Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.**
WHST.6-8.2.D **Use precise language and domain-specific vocabulary to inform about or explain the topic.**	**WHST.9-10.2.D** **Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.**	**WHST.11-12.2.D** **Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.**
WHST.6-8.2.E **Establish and maintain a formal style and objective tone.**	**WHST.9-10.2.E** **Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.**	**WHST.11-12.2.E** **Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implications or the significance of the topic).**
WHST.6-8.2.F **Provide a concluding statement or section that follows from and supports the information or explanation presented.**	**WHST.9-10.2.F** **Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic)**	**WHST.11-12.2.F** **No 2.F at this grade level**

Teacher Notes

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods. Obtaining, evaluating, and communicating information in 9–12 builds on K–8 experiences and

progresses to evaluating the validity and reliability of the claims, methods, and designs (NGSS for states, by states, 2013).		
WHST.6-8.2 Examples of informative/explanatory writing are notes based on observations, summarizations of technical texts, making thinking visible by tracking how understanding of phenomena changes over time, procedures, investigation designs, explanations of models, and research. **WHST.6-8.2.E** Objective tone in science is used when a writer wants to deliver information in a neutral, factual and unbiased way.	**WHST.9-10.2** Examples of informative/explanatory writing are notes based on observations, summarizations of technical texts, making thinking visible by tracking how understanding of phenomena changes over time, procedures, investigation designs, explanations of models, and research. **WHST.9-10.2.E** Objective tone in science is used when a writer wants to deliver information in a neutral, factual and unbiased way.	**WHST.11-12.2** Examples of informative/explanatory writing are notes based on observations, summarizations of technical texts, making thinking visible by tracking how understanding of phenomena changes over time, procedures, investigation designs, explanations of models, and research. **WHST.11-12.2.E** Objective tone in science is used when a writer wants to deliver information in a neutral, factual and unbiased way.

Writing Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Text Types and Purposes		
WHST.6-8.3 **Not applicable as a separate requirement**	**WHST.9-10.3** **Not applicable as a separate requirement**	**WHST.11-12.3** **Not applicable as a separate requirement**
Teacher Notes		
Standard 3 is not included as a separate standard in disciplinary literacy. Students' narrative skills continue to grow in these grades. The standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and possibly reach the same results.		

Writing Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Production and Distribution of Writing		
WHST.6-8.4 **Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.**	**WHST.9-10.4** **Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.**	**WHST.11-12.4** **Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.**
WHST.6-8.5 **With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.**	**WHST.9-10.5** **Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.**	**WHST.11-12.5** **Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.**
WHST.6-8.6 **Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.**	**WHST.9-10.6** **Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.**	**WHST.11-12.6** **Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.**

Teacher Notes
These standards focus on text-based analysis that uses evidence from the text, avoiding the bias of personal opinion. Being a critical consumer of information about science and engineering requires the ability to read or view reports of scientific or technological advances or applications (whether found in the press, or the Internet, or in a town meeting) and to recognize the salient ideas, identify sources of error and methodological flaws, distinguish observations from inferences, arguments from explanations, and claims from evidence. Scientists and engineers employ multiple sources to obtain information used to evaluate the merit and validity of claims, methods, and designs (NGSS for states, by states, 2013).

Writing Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Research to Build and Present Knowledge		
WHST.6-8.7 **Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.**	**WHST.9-10.7** **Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.**	**WHST.11-12.7** **Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.**
WHST.6-8.8 **Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.**	**WHST.9-10.8** **Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.**	**WHST.11-12.8** **Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.**

WHST.6-8.9 **Draw evidence from informational texts to support analysis, reflection, and research.**	WHST.9-10.9 **Draw evidence from informational texts to support analysis, reflection, and research.**	WHST.11-12.9 **Draw evidence from informational texts to support analysis, reflection, and research.**
Teacher Notes		
Being a critical consumer of information about science and engineering requires the ability to read or view reports of scientific or technological advances or applications (whether found in the press, or the Internet, or in a town meeting) and to recognize the salient ideas, identify sources of error and methodological flaws, distinguish observations from inferences, arguments from explanations, and claims from evidence. Scientists and engineers employ multiple sources to obtain information used to evaluate the merit and validity of claims, methods, and designs (NGSS for states, by states, 2013).		

Writing Standards for Literacy in Science		
Grades 6-8	**Grades 9-10**	**Grades 11-12**
Range of Writing		
WHST.6-8.10 **Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.**	**WHST.9-10.10** **Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.**	**WHST.11-12.10** **Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.**
Teacher Notes		
These standards focus on text-based analysis that uses evidence from the text, avoiding the bias of personal opinion. Being able to read, interpret, and produce scientific and technical text is a fundamental practice of science and engineering, as is the ability to communicate clearly and persuasively (NGSS for states, by states, 2013).		
Scientists generally use the APA style guide.	Scientists generally use the APA style guide.	Scientists generally use the APA style guide.

Contributors

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